



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/562,938	12/30/2005	Hannu Makela	47121-5017	8750
55694 7590 12/05/2007 DRINKER BIDDLE & REATH (DC) 1500 K STREET, N.W. SUITE 1100 WASHINGTON, DC 20005-1209			EXAMINER PECHE, JORGE O	
			ART UNIT 3664	PAPER NUMBER
			MAIL DATE 12/05/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/562,938

Applicant(s)

MAKELA ET AL.

Examiner

Jorge O. Peche

Art Unit

3664

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09/04/2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☒ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**KHOI H. TRAN**  
**SUPERVISORY PATENT EXAMINER**

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

1. Receipt is acknowledged of applicant's argument/remarks filed on September 4, 2007, **claims 1-10** are pending and an action on the merits is as follows.

Applicant's arguments with respect to amended **claims 1-10** have been fully considered but are moot in view of the same ground(s) of rejection. Applicant has amended **claims 3-4**.

#### *Foreign Priority*

2. Applicant cannot rely upon the foreign priority papers (FINLAND 20031007 and 20040059) to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

The only times during ex parte prosecution that the examiner considers the merits of an applicant's claim of priority is when a reference is found with an effective date between the date of the foreign filing and the date of filing in the United States and when an interference situation is under consideration. If at the time of making an action the examiner has found such an intervening reference, he or she simply rejects whatever claims may be considered unpatentable thereover, without paying any attention to the priority date (assuming the papers have not yet been filed). The applicant in his or her reply may argue the rejection if it is of such a nature that it can be argued, or present the foreign papers for the purpose of overcoming the date of the reference. If the applicant argues the reference, the examiner, in the next action in the application, may specifically require the foreign papers to be filed in addition to repeating the rejection if it is still considered applicable, or he or she may merely continue the rejection. Form paragraph 2.19 may be used in this instance.

#### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims **1-10** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hakkinen (Pub No.: WO 01/69041 A1)** in view of **Lehtinen et al. ("Mobile robots evolving in industrial applications"**, Proceedings of the 31st International Symposium on Robotics, Montreal, pp.96-101).

Regarding **claim 1**, Hakkinen discloses a method for determining the position of unmanned mining vehicle comprising the step of:

- Driving mining vehicles (3, 4, and 5) on a service gallery (2) and a plurality of mine galleries (1) (first and second work areas) (see page 4, lines 2-10; Figure 1).
- Identifying mining mark (6) and location information (6") to determine the position of the loading vehicle (see page 7, lines 2-5, lines 22-24; Figures 5-7).
- Transmitting location information (6") of the loading vehicle (5) to a computer room (mine control system) by implementing a data communication unit (13) (control unit). Under this process, the transmitted data is used to monitor the operation of the loading vehicle (5) (see page 2, lines 15-23; page 6, lines 1-9, lines 33-34; page 7, lines 1-5; Figures 4-5).

However, Hakkinen's invention fails to disclose a method for determining the location of the mining vehicle substantially continuously on the basis of a dead reckoning, wherein the distance traveled is calculated and the travel direction is determined, and updating the location data determined in the dead reckoning on the basis of the location data of the identifier when driving in the first work area.

However, Lehtinen teaches a dead reckoning unit to determine the position, distance and direction of a vehicle in a mine/underground environment. Furthermore, Lehtinen teaches the use of beacon, transponder and landmark (e.g. location information (6") disclosed on Hakkinen's invention) to adjust the exact absolute pose of a mining vehicle after traveling a certain distance (see page 96, abstract, page 98, left column, par 1-3).

Given the teaching of Lehtinen, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to replace the inertial measurement device (11) of Hakkinen's invention, which can be used as a dead reckoning unit (see page 2, lines 15-23, page 5, lines 28-35; Figure 4), by a dead reckoning device to determine and update the position, distance and direction of a mining vehicle.

Doing so would enhance an autonomous vehicle capable to travel across an environment with small amount of advance information.

Regarding **claims 2-5**, Hakkinen discloses a method for determining the position of unmanned mining vehicle comprising the step of:

- Placing a location information mark (6") (readable identifier) in a mine gallery (1) (first work area) (see page 4, lines 2-10; page 7, lines 1-5; Figures 1 and 5).

- Arranging positioning marks (6' and 6") in advance to the loading vehicle control unit (19) (see page 6, lines 10-36; page 7, lines 1-13; Figure 5).
- Reading position mark (6') and location information (6') (identifier) placed in the mine gallery (1) with a reader device (12) to determine the location of the loading vehicle (5) (see page 4, lines 2-10; page 6, lines 33-36; page 7, lines 1-13; Figures 1-5).

However, Hakkinen's invention fails to disclose a method for updating the location data obtained on the basis of the dead read reckoning; arranging at least one identifier comprising a receiver in the first work area, and transmitting a signal for reading the identifier from a transmitter in the mining vehicle when driving in the first work area

However, Lehtinen teaches a dead reckoning unit to determine the position, distance and direction of a vehicle in a mine or underground environment. Furthermore, Lehtinen teaches the use of landmark (e.g. location information (6") disclosed on Hakkinen's invention) to adjust or update the exact absolute pose of a mining vehicle after traveling a certain distance (see page 96, abstract, page 98, left column, par 1-3).

Furthermore, Lehtinen teaches the use of a visual beacon unit at known location to improve mining/underground vehicle position, which can replace or be added to the location information mark (6") (see page 96, right column, par 7; page 98, left column, par. 1-3). As the visual beacon is capable to transmitted location/position signal and the mining vehicle, with a dead reckoning and control unit (19), can transmit a request signal for location/position (see Figure 5), it would be obvious that a

mining/underground vehicle and the beacon unit can communicate between each other to determine the mining vehicle location.

Doing so would enhance an autonomous vehicle capable to travel across an environment with small amount of advance information and obtain real time vehicle position by implementing a plurality beacon of unit.

Regarding **claim 6**, Hakkinen discloses a wireless communication system to transmit position, location, and operation of the loading vehicle to a control room (see page 4, lines 1-15; page 7, lines 1-5; Figures 1 and 4). Under this process, it would be obvious that the wireless communication system would have at least one base station and or repeater on the mine gallery (1) and a service gallery (2) to forward the loading vehicle information to the control room (see prior art made of record at conclusion).

However, Hakkinen's invention fails to disclose a method for updating the location data obtained on the basis of the dead reckoning.

However, Lehtinen teaches a dead reckoning to determine the position, distance and direction of a vehicle in a mine or underground environment. Furthermore, Lehtinen teaches the use of beacon and landmark (e.g. location information (6") disclosed on Hakkinen's invention) to adjust or update the exact absolute pose of a mining vehicle after traveling a certain distance (see page 96, abstract, page 98, left column, par 1-3).

Doing so would enhance an autonomous vehicle capable to travel across an environment with small amount of advance information and obtain real time vehicle position by implementing a plurality beacon of unit.

Regarding **claim 7**, Hakkinen discloses a method for determining the position of unmanned mining vehicle comprising the step of:

- Driving mining vehicles (3, 4, and 5) on a plurality of mine galleries (1) and a service gallery (2) (see page 4, lines 2-10; Figure 1). It would be obvious that a loading vehicle (5) would drive from a service gallery (2) (unloading area) to a mine gallery (1) (loading area).
- Loading cargo into the loading vehicle (5) in the mine gallery (1) (see Figure 5).

Under this process, it would be obvious that the loading vehicle (5) would drive its cargo from the mine gallery to the service gallery to unload its cargo.

However, Hakkinen's invention fails to disclose a method for determining the location of the mining vehicle in the loading area only on the basis of the dead reckoning, and determining the location of the mining vehicle in the unloading area both on the basis of the dead reckoning and by reading at least one identifier arranged in the unloading area.

However, Lehtinen teaches a dead reckoning to determine the position, distance and direction of a vehicle in a mine or underground environment. Furthermore, Lehtinen teaches the use of beacon and landmark (e.g. location information (6") disclosed on Hakkinen's invention) to adjust or update the exact absolute pose of a mining vehicle after traveling a certain distance (see page 96, abstract, page 98, left column, par 1-3).

Under this process, as the mining vehicle (4) excavates new section on the mine gallery (1), it would be obvious that location information mark (6") would not be available on this new area. Therefore, it would be obvious that the mining vehicle would only



implement its dead reckoning device to navigate in the new area or section of the mine gallery (1). Furthermore, as the mining vehicle transport its cargo to the service gallery (unload area), the mining vehicle can relay on its dead reckoning unit and beacon device (identifier) installed across (critical location) the mining/underground area, which can include service gallery (unload area), to accurately adjust and/or update the exact absolute pose of a mining vehicle after traveling a certain distance.

Doing so would enhance an autonomous vehicle capable to travel across an environment with small amount of advance information and obtain real time vehicle position by implementing a plurality of beacon unit.

Regarding **claims 8-10**, Hakkinen discloses a system to determine the position of unmanned mining vehicle comprising:

- A plurality of mine galleries (1) and a service gallery (2) (first and second work areas) to drive mining vehicles (3, 4, and 5) (see page 4, lines 2-10; Figure 1).
- A computer room (mine control system) to wirelessly receive (data transfer connection) location information (6") of the loading vehicle (5) by implementing a data communication unit (13) (control unit). Under this apparatus, the transmitted data is used to monitor the operation of the loading vehicle (5). To monitor the exact location of the loading vehicle by an operator or server, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to conclude that the position of the mine location information (6") (predetermined location of the identifier) is known to the computer room (see page 2, lines 15-23;

page 4, lines 10-17; page 6, lines 1-9, lines 33-34; Page 7, lines 1-5; Figures 4-5).

- Mining mark (6) and location information (6'') (identifier) are placed in advance to the loading vehicle control unit (19) in a mine gallery (1). Under this system, the loading vehicle (5) implements a reader device (12) to read the location information (6'') (identifier/ location data) to determine its position and location (see page 6, lines 10-36; page 7, lines 2-13, lines 22-24; Figures 5-7).

However, Hakkinen's invention fails to disclose a system for monitoring the location of a mining vehicle comprising at least one measuring device for determining the distance traveled by the mining vehicle, and further at least one measuring device for determining the direction of the mining vehicle; and the location of the mining vehicle is arranged to be determined substantially continuously on the basis of a dead reckoning by taking into account the distance traveled and the direction;

However, Lehtinen teaches a dead reckoning (measuring device) to determine the position, distance and direction of a vehicle in a mine/underground environment. Furthermore, Lehtinen teaches the use of beacon, transponder and landmark (e.g. location information (6'')) to adjust or update the exact absolute pose of a mining vehicle's dead reckoning after traveling a certain distance (see page 96, abstract, page 98, left column, par. 1-3). Furthermore, as the mining vehicle transport its cargo to the service gallery (unload area), the mining vehicle can relay on its dead reckoning unit and beacon device (identifier) installed across the mining/underground area (critical

location), which can include service gallery (unload area), to accurately adjust and/or update the exact absolute pose of a mining vehicle after traveling a certain distance.

Given the teaching of Lehtinen, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to replace the inertial measurement device (11) of Hakkinen's invention, which can be used as a dead reckoning unit (see page 2, lines 15-23, page 5, lines 28-35; Figure 4), by a dead reckoning device to determine and update the position, distance and direction of a mining vehicle.

Doing so would enhance an autonomous vehicle capable to travel across an environment with small amount of advance information.

#### ***Response to Argument***

In the Applicant's arguments/remarks filed on September 4, 2007, with respect to the rejections of **claims 1-10** under 35 U.S.C. 103(a) as being unpatentable over **Hakkinen (Pub No.: WO 01/69041 A1)** in view of **Lehtinen et al. ("Mobile robots evolving in industrial applications"**, Proceedings of the 31st International Symposium on Robotics, Montreal, pp.96-101) have been fully considered but are not persuasive.

Regarding Applicant's first argument (page 9, par. 2), "As such, it is very difficult to arrange any identifiers for updating purposes therein. In contrast, in the first work area, the conditions are better. As such, the first work area is provided with identifiers, the exact locations of which are known. None of the art of record discloses these patentable features." The Examiner respectfully disagrees. Applicant argument intends to bring limitation appearing in the specification but not recited in the claim.

Regarding Applicant's second argument (page 9, par. 3 – page 10, par.2), "The mining vehicle does not include any measuring devices. Hakkinen discloses to first measure and mark the mine with a separate measuring vehicle, and only thereafter, the mining vehicle can be driven accurately in the mine." The Examiner respectfully disagrees. A thought reading of Hakkinen in view of Lehtinen reveals that what is argued is clearly supported. Hakkinen discloses a reader unit (12) (measuring device) located on the mining vehicle mining vehicle to determine the vehicle location. Applicant is kindly invited to consider the references as a whole and for this argument, concentrate on Hakkinen's page 6, line 33 – page 7, line 13; Figures 4,5, and 7. Furthermore, Applicant is kindly invited to view the above grounds of rejection for more detail comment.

Regarding Applicant's third argument (page 10, par. 2 – page 10, par. 3), "First, the mine vehicle in Hakkinen does not include any inertial measurement device. As described above, Hakkinen seeks to eliminate the use of any measurement devices, and uses a separate measuring vehicle to accomplish this task. Accordingly, one having ordinary skill in the art would not look to add the dead reckoning to the mine vehicle of Hakkinen, because it would make the mine vehicle more complex and expensive." The Examiner respectfully disagrees. A thought reading of Hakkinen in view of Lehtinen reveals that what is argued is clearly supported. Hakkinen discloses an inertial measurement device (11) arranged in the mining vehicle to provide continuous location information on the vehicle position. Furthermore, replacing the inertial measurement device (11) (Hakkinen's reference) by a dead reckoning (Lehtinen's reference) would

not make the system more complex neither expensive. Instead, it would make the mining vehicle less complex due to the well known and used dead reckoning technology, and the elimination of the several wireless repeaters in the mine, inertial measurement unit and wireless transceiver on the mining vehicle would make the replacement process less expensive. Furthermore, this replacement would make the mining vehicle more independent and autonomous in case of a communication problem between the central control system and the mining vehicle. Applicant is kindly invited to consider the references as a whole and for this argument, concentrate on Hakkinen's page 5, line 28 – page 6, line 9. Furthermore, Applicant is kindly invited to view the above ground of rejection for more detail comment.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Base Station and/or repeater: **Bassiri et al** (see page 1, par. 3, 6, 7; page 5, par. 43-45; Figures 5-9).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jorge O. Peche whose telephone number is 571-270-1339. The examiner can normally be reached on 8:30 am - 5:30 pm Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Khoi H. Tran can be reached on 571-272-6919. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number:  
10/562,938  
Art Unit: 3664

Page 14



Jorge O. Peche

Patent Examiner  
Art Unit 3664  
November 23, 2007

KHOI H. TRAN  
SUPERVISORY PATENT EXAMINER

